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Technical Efficiency of Small and Medium Enterprise in Malaysia: A Stochastic Frontier Production Model

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ABSTRACT

Small and medium enterprises (SMEs) play a vital role in the Malaysian economy and are considered as the backbone of industrial development in the country. However, SMEs' value added is very much lower than that of large scale enterprises. The low productivity of physical inputs or factors efficiency may be attributed to the low level of value added. The objective of this study is to determine the technical efficiency of 7360 small and medium enterprises for the year 2004 using stochastic frontier model. Results show that the number of firms considered technically efficient is only 3.06 percent of the total firms, while total technical inefficiency varies from 0.30 to 97.10 percent. Thus, policy makers have to play an important role in promoting economies of scale and developing technical skills of labors, which will lead to higher efficiency levels among SMEs.

Keywords: Small and medium enterprises, technical efficiency, stochastic frontier model.

INTRODUCTION

The Small and Medium Enterprise (SME) sub sector plays a vital role in the Malaysian economy and is considered as the backbone of industrial development in the country. An enterprise is considered as an SME based on the annual sales turnover or

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number of full-time employees. An SME in the manufacturing sector is defined as an enterprise with full-time employees not exceeding 150 employees or with annual turnover not exceeding RM25 million. On the other hand, SMEs in the service and primary agricultural sector and ICT are enterprises with full-time employees not exceeding 50 or annual turnover not exceeding RM5 million. The SMEs in both sectors are further categorized into medium, small and micro enterprises, as shown in Table 1.

Table 1 Definition of SMEs in Malaysia

Category	Micro Enterprise	Small Enterprise	Medium Enterprise
Manufacturing, manufacturing-related services and agro based industries	Sales turnover of less than RM250,000, or fewer than 5 fulltime employees.	Sales turnover of less than RM250,000, or fewer than 5 fulltime employees.	Sales turnover between RM10 million and RM25 million, or between 51 and 150 fulltime employees.
Services, primary agriculture and information and communication technology (ICT)	Sales turnover of less than RM200,000, or fewer than 5 fulltime employees.	Sales turnover between RM200,000 and RM1 million, or between 5 and 19 full-time employees.	Sales turnover between RM1 million and RM5 million, or between 20 and 50 full-time employees.

Source: Small and Medium Industries Development Corporation (SMIDEC), 2005.

As in 2003, there were 523,132 establishments in the manufacturing, services and agricultural sectors, of which 518,996 (99.2 percent) comprised SMEs (SMIDEC, 2005). In terms of distribution by industry, SMEs were mostly in the textiles and apparel and resource based industries. The textiles and apparel industry accounted for 23.2 percent of total SMEs, followed by food and beverages (15 percent), metals and metal products (12.4 percent) and paper, printing and publishing (9.2 percent), as shown in Table 2.

On the other hand, out of 451,516 establishments in the services sector, 449,004 (99.4 percent) were SMEs. Of the total SMEs, 69.3 percent were in distributive trade (wholesale, retail and restaurants), followed by transport and communication (6.2 per cent), financial intermediaries (4.3 percent) and professional services (2.5 percent), as illustrated in Table 3. In the agricultural sector, out of 32,397 active companies, 32,126 (99.2 per cent) were SMEs. Of the total SMEs, 65.8 percent were in farming, marketing, plantation and horticulture, followed by fisheries (20.9 percent), poultry farming (6.9 percent) and agricultural and animal husbandry services (4.8 per cent) (Department of Statistics, 2005).

Table 2 Distribution of Small and Medium Enterprises by Sub-Sector, 2003

Sub-Sector	Total Number of Establishments	SMEs	
		Number	Share (%)
Total	39,219	37,866	100.0
Textiles and apparel	8,855	8,779	23.2
Food and beverage	5,804	5,664	15.0
Metals and metal products	4,809	4,686	12.4
Paper, printing and publishing	3,549	3,483	9.2
Furniture	2,352	2,286	6.0
Rubber and plastics products	2,343	2,166	5.7
Wood and wood products	2,149	2,052	5.4
Non-metallic mineral products	1,708	1,650	4.4
Machinery and equipment	1,435	1,390	3.7
Electrical and electronics	1,362	1,077	2.8
Chemicals and chemical products	1,115	1,047	2.8
Transport equipment	769	699	1.8
General manufacturing[1]	2,969	2,887	7.6

Note: [1] *Include leather products, tobacco products, medical, precision and optical* instruments, recycling and petroleum products.
Source: Census of Establishments and Enterprises, 2005 (preliminary data), Department of Statistics, Malaysia.

SMEs play a vital role in the Malaysian economy in terms of output, value added, employment and exports. In 2005, output from SMEs registered an average annual growth rate of 5.3 percent which contributed to an increase in total manufacturing output from 22.1 percent in 1996 to 29.6 percent in 2005. In other aspects, the growth of value-added by SMEs was 9.2 percent, compared with the overall growth of 9.8 per cent for the manufacturing sector in 2005. The SMEs also employed 394,670 workers in 2005, representing 31.1 percent of total employment in the manufacturing sector, compared with 329,848 workers, or 29.6 percent, in 1996. In terms of trade, SMEs exported 25.6 percent of their total output in 2005, compared with 20.8 percent in 1996 (National Productivity Centre, 2005).

In the period of the Second Industrial Master Plan (IMP 2), there was an increase in the contribution of SMEs to the manufacturing sector; however, inherent structural weaknesses in terms of technology utilization, research and development activities, technical, professional and management expertise prevented full realization of their potential. Generally, SMEs operate at low levels of technology and therefore experience lower productivity. From a survey conducted in 2003, less than 5 percent of SME business operations were fully automated, while 75 per cent were semi-automated. Based on the same survey, SMEs that undertook R&D activities accounted for 55 percent of the SMEs surveyed. Of the SMEs which undertook

Table 3 Distribution of Small and Medium Enterprises in Agriculture by Sub-Sector, 2003

Sub-Sector	Total Number of Establishments	SMEs Number	SMEs Share (%)
Total	451,516	449,004	100.00
Wholesale and retail	249,178	248,221	55.3
Restaurants	63,067	63,013	14.0
Transport and communication	28,231	27,980	6.2
Financial intermediaries	19,291	19,108	4.3
Professional services	11,245	11,120	2.5
Real estate activities	8,847	8,779	2.0
Business and consultancy services	8,404	8,352	1.9
Health[1]	7,838	7,759	1.7
Education	7,618	7,618	1.7
Computer services	1,182	1,095	0.2
Telecommunications	88	58	neg.[3]
Selected services[2]	43,913	43,626	9.7

Notes: [1] *Include hospital, medical, dental and veterinary services, homeopathy and foot* reflexology.
[2] Include rental services, advertising, research and development, business activities (such as labour recruitment, cleaning of buildings, packaging services and duplication services), recreation, cultural and sporting activities (such as motion picture projection and recreation clubs) and other service activities (such as hair dressing, beauty and funeral services).
[3] Negligible.
Source: Census of Establishments and Enterprises, 2005 (preliminary data), Department of Statistics, Malaysia.

R&D, only 59.4 per cent concentrated on process improvement, 44 percent focused on new product development, and 21.9 percent emphasized on innovation and technology (Second Industrial Master Plan (IMP2), 1996-2005).

Generally, SMEs are also poorly managed due to the lack of management skills among owners or managers. They lack awareness of the importance of adopting business best practices and quality management systems, such as financial management and customer focused activities, in order to enhance the firms' productivity and profitability. An efficient SME uses inputs at optimum levels and hence, reduce the usage of unnecessary inputs to attain the level of a given output or the SME would maximize output at a given input level. Hence, revenue and profits would be maximized. Efficient SMEs generate industrial growth which subsequently activates economic growth. Conversely, an inefficient SME will incur unnecessary cost and wastage resulting in low returns on invested capital. Inefficiency is a result of using excessive inputs at a given output level or poor output at a given input level. Inefficiency increases cost of production which affects price, sales and revenue. As a result, inefficient SMEs are unable to compete effectively in the market impacting the entire small and medium enterprise (SMEs) sector performance. Thus, this study aims to analyze the technical efficiency of these industries by using stochastic frontier production model.

LITERATURE REVIEW

Apart from their roles in terms of their contribution to exports, employment and economic growth, there is wide recognition in past studies that examined and described the challenges and barriers faced by Malaysian SMEs. The challenges in the globalised environment are discussed in some existing literatures which include Wan (2003); Stuti (2005); Moha (1999); Hall (2002); and SMIDEC (2000). Wan (2003) highlighted the challenges as lack of financing, low productivity, lack of managerial capabilities, access to management and technology, and heavy regulatory burdens, among many others.

However, in the Malaysian context, the challenges faced by SMEs have been highlighted by the APEC survey (1994), the SMI Development Plan 2001–2005 (SMIDEC, 2002), and Ting (2004). These sources identified lack of access to loans, limited adoption of technology, lack of human resources and competition from Multinational Companies (MNCs) and globalisation as the challenges faced by Malaysian SMEs. More recently, Saleh and Ndubisi (2006) conducted a pilot survey of 100 Malaysian SMEs to determine competitiveness issues within the SMEs. Some of the issues identified include high labor cost, lack of innovation, access to funding and working capital.

This growing number of challenges as discussed above may contribute to the low level of efficiency among the SMEs in Malaysia. A previous research found that a low level of productivity and input quality may attribute to low levels of value added in SMEs, which further affects the level of optimum efficiency in the production process (Saleh and Ndubisi, 2006).

The efficiency of SMEs is central to debates about the role of small-scale industries in economic development. Some studies found that SMEs were more efficient than large firms in some industrial sectors but not in others, while other studies found them were less efficient overall. These mixed evidences about how efficient SMEs are relative to larger firms are discussed in Little, Mazumdar and Page (1987); Cortes, Berry and Ishaq (1987); and Liedholm and Mead (1987). Additionally, previous researches found that most of SMEs were less efficient on average than their larger counterparts in five countries (Malaysia, Indonesia, Mexico, Colombia, Taiwan), but a significant number of highly efficient SMEs were found, and they were relatively more productive than some large firms, Geeta Batra and Hong Tan,(2003). The same research also stated that efficient firms had better access to new technology through knowledge, licensing agreements, joint ventures with foreign partners, and export contacts with foreign buyers and suppliers. They had a more educated work force, and were more likely to provide formal structured training to their workers, Geeta Batra and Hong Tan, (2003). These asymmetric efficiency results by skill group were consistent with the findings reported in Tan and Batra (1995).

Stochastic frontier production function has been used by researchers to examine firms' technical efficiency. Early applications of stochastic frontier production function to economic analysis include those of Aigner *et al.* (1977) in which they applied the stochastic frontier production function in the analysis of U.S agricultural data. Battese and Corra (1977) applied the technique to the pastoral zone of Eastern Australia. More recently, empirical applications of the technique in efficiency analysis have been reported by Battese *et al.* (1993); Ajibefun and Abdulkadri (1999); and Ojo and Ajibefun (2000). In addition, Shazali *et al.* (2004) examined the technical efficiency of the Malaysian Furniture Industry using the stochastic frontier production model. They found that actual firm's output is 20 percent less than maximal output which can be achieved from the existing level of inputs.

In this study, the stochastic frontier production function as proposed by Battese and Coelli (1992) was used to examine the technical efficiency of SMEs in Malaysia. Then, a Cobb-Douglass stochastic frontier production function was estimated using data from 7360 enterprises in Malaysia for year 2004. This stochastic frontier production function is briefly discussed in the next section.

METHODOLOGY

The stochastic frontier production function developed by Aigner *et al.* (1977), and Meeusen and van den Broeck (1977) was based on an econometric specification of a production *frontier*. A stochastic frontier production function as proposed by Battese and Coelli (1992) which can be defined as:

$$Y_i = f\left(X_i, \beta\right) e^{\varepsilon_i} \tag{1}$$

Y_i is output vector for the ith firm, X_i is vectors of inputs, β is a vector of parameter and ε_i is an error term. In this model, a production frontier defines output as a function of a given set of inputs, together with technical inefficiency effects. The stochastic frontier is also known as the *composed error* model, because it postulates that the error term ε_i is composed of two independent error components.

$$\varepsilon_i = v_i + u_i \tag{2}$$

Where $v_i \sim N(0, \sigma_v^2)$ represent any stochastic factors beyond the firms' control affecting its ability to produce on the frontier, such as luck and weather, where a symmetric component is normally distributed. It can also account for measurement of error in Y_i or minor omitted variables. The asymmetric component, in this case distributed as a half-normal, $u_i \sim |N(0,\sigma_v^2)|$, $u_i \geq 0$, can be interpreted as pure technical inefficiency. This component has also been interpreted as an unobservable or latent variable, in most cases representing managerial ability.

The parameters of v and u can be estimated by maximizing the log-likelihood function shown as follows:

$$\ln\left(Y \sim \beta,\lambda,\sigma^2\right)=\frac{N}{2}\left(\ln\frac{2}{\Pi}\right)-N\ln\sigma+\sum_{i=1}^{N}\ln\left(1-F\left(\varepsilon_i,\lambda,\sigma^{-1}\right)\right)-\frac{1}{2}\sigma^2\sum_{i-1}^{N}\varepsilon_i^2 \quad (3)$$

where;

$$\varepsilon_i = Y - f\left(X_i;\beta\right)$$
$$\sigma^2 = \sigma_u^v + \sigma_v^2$$
$$\lambda = \frac{\sigma_u}{\sigma_v}$$
$$\sigma = \sqrt{\sigma_u^2 + \sigma_v^2}$$

F = The standard normal distribution function
N = Number of observation

Given the assumption on the distribution of v and u, Jondrow *et al*. (1982) showed that the conditional mean of u given ε is equal to

$$E\left(u_i\varepsilon_i\right)=\frac{\sigma_u\sigma_v}{\sigma}\left[\frac{f\left(\varepsilon_i\lambda\sigma\right)}{1-f\left(\varepsilon_i\lambda\sigma\right)}-\frac{\varepsilon_i\lambda}{\sigma}\right] \quad (4)$$

where f and F the standard normal density and distribution function is evaluated at $\frac{\varepsilon_i\lambda}{\sigma}$. Measures of technical efficiency (TE_i) for each firm can be calculated as;

$$TE_i = \exp(-E[u_i|\varepsilon_i]) \text{ so that } 0 \leq TE_i \leq 1 \quad (5)$$

The Cobb-Douglas stochastic frontier production function in logarithm form is as follows;

$$\ln Y_i = \ln\beta_0 + \beta_1 \ln C_i + \beta_2 \ln L_i + \beta_3 \ln W + \beta_4 \ln E + \beta_i \quad (6)$$

where Y represent value added (RM) per year. Independent variables are C (capital, RM), L (numbers of labor), W (water, RM) and E (energy, RM). Water and energy (electricity, oil and gas), are two important input components in the processing industry. Water, particularly in the food processing industry, has been used both as an ingredient as well as a cleaning agent. By the same token, energy is required to run machines which are directly and indirectly used in production or operations. Parameter β_0 denotes the technical efficiency level and β_i are elasticities of the various inputs with respect to level of output. The advantage of using the stochastic production frontier model is the introduction of a disturbance term representing noise, measurement error and exogenous shock beyond the control of the production unit in addition to the efficiency component.

RESULTS AND DISCUSSION

Table 4 presents the summary of data used in the descriptive analysis of SMEs in Malaysia which includes micro, small and medium enterprises. These firms can be differentiated from each class by total output, raw materials, value added and total assets as well as other variables such as labor, wage, water and energy

The empirical estimates of stochastic production frontier for Small and Medium Enterprises (SMEs) in Malaysia are presented in Table 5. For comparison purposes, both the average production function estimated using ordinary least square (OLS) and the Maximum Likelihood Estimation (MLE) are shown in Table 5. All variables in MLE are significant at 1 percent level. Positive signs of all coefficients implied that, an increase in an input will ultimately increase the output level. The summation of the elasticities of the production function indicates the return to scale for both OLS and MLE is 1.07 percent. In this case, a 1 percent increase in all inputs resulted in an increase of 1.07 percent in output level for stochastic frontier.

A direct comparison of the parameters estimated for OLS and MLE shows the presence of close similarity between the intercepts and inputs coefficients, as shown in Table 5. The intercept differences between the two production functions suggest that MLE represents neutral shifts from the OLS. On the other hand, the slope of coefficients displays a slight difference between the two functions and it might be due to the inefficient estimates of OLS. Furthermore, by the specification of likelihood function, the difference between both production functions estimated by the OLS and MLE can statistically be shown by the significance of the λ. It implies that there exists a significant difference between the two production functions.

The significance of the parameter λ is able to show that there exists sufficient evidence to suggest technical efficiency is present in the data. As shown in Table 5, the estimates of the error variances σ_u^2 and σ_v^2 are 0.8442 and 0.1850 respectively, whereas the variance of one-side error, σ_u^2 is larger than the variance of random error, σ_v^2. Thus, the value of λ of more than one clearly shows the dominant share of the estimated variance of the one-side error term, u, over the estimated variance of the whole error term. That means that a greater part of residual variation in output is associated with the variation in technical inefficiency rather than with measurement error related to uncontrollable factors of the production process.

Table 4 Summary of Data Used

	Mean	Std. Deviation	Minimum	Maximum
Micro Enterprises (n = 1031)				
Output (RM)	192850.43	411894.32	1050.00	9437991.00
Raw material (RM)	96665.00	266136.24	318.00	7523138.00
Value added (RM)	96185.44	238717.54	65.00	7254817.00
Total asset (RM)	116469.73	350466.99	183.09	5475392.00
Labor	6	4	1	49
Wage (RM)	38775.35	42521.62	1000.00	532829.00
Water (RM)	848.72	2487.85	100.00	59635.00
Energy (RM)	8679.83	44041.91	210.00	1379414.00
Small Enterprises (n = 3539)				
Output (RM)	2072108.43	2040834.23	250672.31	9997606.00
Raw material (RM)	1159823.87	1392264.34	738.00	8443867.00
Value added (RM)	912284.56	935677.80	12287.16	8775803.00
Total asset (RM)	1042660.07	2194737.14	295.00	40133106.68
Labor	23	12	5	50
Wage (RM)	328737.23	282020.57	3808.51	3354722.00
Water (RM)	4604.33	10273.48	100.00	191544.00
Energy (RM)	67052.75	117262.08	211.25	1841623.00
Medium Enterprises (n=2790)				
Output (RM)	19024248.24	188963851.10	109829.00	6933721499.00
Raw material (RM)	10849166.77	103236165.03	2704.00	3569190953.00
Value added (RM)	8175081.46	90102170.87	12783.75	3364530546.00
Total asset (RM)	9011332.18	123405674.30	414.75	5963219510.00
Labor	108	71	4	827
Wage (RM)	1664198.17	1132748.29	47241.25	14256308.00
Water (RM)	26100.47	62529.57	100.00	1519944.00
Energy (RM)	558892.30	4609503.91	2176.00	226948129.00
Total (n = 7360)				
Output (RM)	8235009.93	116645921.42	1050.00	6933721499.00
Raw material (RM)	4683893.15	63745237.97	318.00	3569190953.00
Value added (RM)	3551116.78	55591032.37	65.00	3364530546.00
Total asset (RM)	3933650.96	76090856.90	183.09	5963219510.00
Labor	53	62	1	827
Wage (RM)	794360.24	997940.56	1000.00	14256308.00
Water (RM)	12226.91	40650.95	100.00	1519944.00
Energy (RM)	245320.40	2849548.32	210.00	226948129.00

Source: Annual Survey of Manufacturing Industries (2004), Department of Statistics, Malaysia

Table 5 Empirical Estimates of Ordinary Least Square (OLS) and Maximum Likehood Estimation (MLE)

	OLS Estimate		ML Estimate	
	Coefficient	**Std. Error**	**Coefficient**	**Std. Error**
Constant	6.3629	0.0586	7.0955	0.0360
ln(Capital)	0.1508	0.0054*	0.1502	0.0035*
ln(Labor)	0.5691	0.0120*	0.5686	0.0078*
ln(Water)	0.1017	0.0077*	0.1013	0.0068*
ln(Energy)	0.2457	0.0089*	0.2450	0.0059*
R^2		0.8125		
Log likelihood function			-7841.2180	
$\lambda = \frac{\sigma_v}{\sigma_u}$			2.1363	0.0352
$\sigma = \sqrt{\sigma_v^2 + \sigma_u^2}$			1.0145	0.0087
σ_v^2			0.1850	
σ_u^2			0.8442	
σ_v			0.4301	
σ_u			0.9188	

Note: * Significant at 1 percent level

According to Battese and Cora (1977), we can also estimate the total variation in output from frontier that is attributable to technical efficiency using the parameter Ω, where Ω equal σ_u^2/σ^2. After calculating using this formula, the Ω is 0.8202. This means, 82 percent of the discrepancies between observed output and frontier output are due to technical inefficiency.

The technical efficiency indexes using Jondorow *et al.,* (1982) procedure are presented in Table 6. The level of technical efficiency for each individual firm in each type of enterprises, e_i^{-u}, is calculated by estimating the one-side error U_i from equation 4. By considering all firms (micro, small, medium enterprises), the maximum estimated efficiency is 97.10 percent while the minimum is 0.30 percent, and the mean level of technical efficiency is 52.62 percent. According to Grabowski *et al.,* (1990), a firm is considered technically inefficient even if the firm registered a technical efficiency index of 82 percent. By this standard, the number of firms considered technically efficient is only 3.06 percent of total SME firms.

The SMEs analyzed in this study comprised micro, small and medium enterprises. In general economic sense, because of firm size, resource allocations, lower per unit cost and technology adoption among the three types of enterprises, the medium enterprises should attain the highest efficiency level followed firstly by small

Table 6 Firm Specific Technical Efficiencies in Stochastic Production Frontier

	Micro Enterprises		Small Enterprises		Medium Enterprises		Total	
	Frequency	**%**	**Frequency**	**%**	**Frequency**	**%**	**Frequency**	**%**
Less than 10%	37	3.59	10	0.28	21	0.75	68	0.92
10.00 - 19.99%	70	6.79	62	1.75	49	1.76	181	2.46
20.00 - 29.99%	137	13.29	183	5.17	174	6.24	494	6.71
30.00 - 39.99%	191	18.53	422	11.92	368	13.19	981	13.33
40.00 - 49.99%	215	20.85	680	19.21	514	18.42	1409	19.14
50.00 - 59.99%	174	16.88	825	23.31	614	22.01	1613	21.92
60.00 - 69.99%	120	11.64	719	20.32	542	19.43	1381	18.76
70.00 - 79.99%	71	6.89	501	14.16	347	12.44	919	12.49
80.00 - 89.99%	16	1.55	130	3.67	144	5.16	290	3.94
90.00 - 99.99%	0	0.00	7	0.20	17	0.61	24	0.33
Total	**1031**	**100**	**3539**	**100**	**2790**	**100**	**7360**	**100**
Mean		43.72		54.35		53.71		52.62
Std. Deviation		18.36		15.91		17.10		17.11
Minimum		0.30		4.17		1.14		0.30
Maximum		87.84		91.71		97.10		97.10

enterprises and then by micro enterprises. From Table 6, as expected, the mean efficiency index of the micro enterprises is the lowest at 43.72 percent, with standard deviation 18.36. The medium enterprises which are expected to obtain the highest mean efficiency index gave contradictory results. The mean efficiency index of the medium enterprises is 53.71 percent as compared to 54.35 percent for small enterprises. The standard deviation of the indexes for small enterprises and medium enterprises are 15.9 and 17.11 respectively. A higher standard deviation for medium enterprises shows generally low performance even though the maximum efficiency index is 97.10. The results indicate that there might be some resource misallocation in the medium enterprise industries. This requires further investigations as to what are the causes of the low efficiency.

CONCLUSION AND POLICY IMPLICATIONS

The development of SMEs in the country, over the years, has shown significant improvements in terms of production. Nevertheless, this study has uncovered the level of operations efficiency. Overall, and according to Grabowski *et al* (1990) standard, Malaysian SMEs are inefficient. Decoupling the SMEs, the small enterprise is relatively more technically efficient than the medium enterprise which is against the economic priory. The micro enterprise, as postulated, is the least efficient among the three types of enterprises.

Despite the increase in production, efficient use of resources is an issue which needs to be addressed. Higher returns from a unit of input lead to greater productivity and hence maximizes a firm's income and profit. Resource wastage and leakage can thus be avoided and this will contribute to a firm's productivity. This is an ideal situation but, it is the goal a firm should strive to achieve.

The present policy of SME development needs to be further consolidated with the promotion of economies of scale in the firm's operations. This is to ascertain that the SMEs attain a certain level of sustainable competitiveness. Efficiency and lean production shall be the focus of SMEs in order to sustain operations and growth. In order to achieve this aspiration, the policy makers have to play significant roles in formulating adequate policies and programs. Thus, efforts should be taken to assist SMEs to develop their managerial and technical skills especially in creating innovations and generating economic value from knowledge. Existing training and outreach programs should aim at enhancing entrepreneurial skills and capabilities in the area of business planning, marketing and financial management among the owners/managers. The success and growth of the Small and Medium Industries will significantly contribute to overall national economic growth.

REFERENCES

Aigner, D. J., Lovell, C. A. K. and Schmidt, P. (1977). Formulation and Estimation of Stochastic Production Function Models. *Journal of Econometrics*, **6,** 21-37.

Ajibefun, I. A., Battese, G. E. and Kada, R. (1996). Technical Efficiency and Technological Change in the Japanese Rice Industry: a Stochastic Frontier Analysis. Centre for Efficiency and Productivity Analysis (CEPA) *Working Paper 9/96. University of New England.*

APEC (1994). *The APEC Survey on Small and Medium Enterprises: Member Report of Malaysia.* online available at http://www.actetsme.org/archive/smesurvey.html. retrieved on 26–8–05.

Battese, G. E. and Corra, G. (1977). Estimation of a Production Function Frontier Model: With Application to the Pastrol Zone of Eastern Australia. *Australian Journal Agricultural Economics*, **21**, 169-179.

Battese, G. E. and Coelli, T. J. (1992). Frontier Production Functions, Technical Efficiency and Panel Data, with Application to Paddy Farmers in India. *Journal of Productivity Analysis,* **3,** 153-169.

Battese, G. E. and Coelli, T. J. (1995). A Model for Technical Inefficiency Effects in a Stochastic Frontier Production Function for Panel Data. *Empirical Economics,* **20 (2),** 325-332.

Department of Statistics, Malaysia (2005). Census of Establishments and Enterprises (preliminary data).

Department of Statistics (2005). National Productivity. Various Issues.

Cortes, M., Berry, A. and Ishaq, A. (1987). *Success in Small and Medium Scale Enterprises, The Evidence from Colombia.* Baltimore, Maryland, Johns Hopkins Press.

Hall, C. (2002). *Profile of SMEs and SME Issues in APEC 1999–2000.* APEC SME Ministerial Meeting, Mexico.

Grabowski, R, Kraft, S. Pasurka, C. and Hassan. A. (1990). *A Ray-Homothenic and Efficiency: Grain Farms in Southern Illinois. Eroupean Review Agricultural Economics*, **17**, 435-448.

Jondrow, J., Lovell, C. A. K., Materov, I. S. and Schmidt, P. (1982). *On Estimation of Technical Inefficiency in the Stochastic Frontier Production Function Model*. *Journal of Econometrics,* **19 (2/3)**, 233-238.

Liedholm, C. and Mead, D. (1987). *Small Scale Industries in Developing Countries: Empirical Evidence and Policy Implications.* Working Paper, Department of Agricultural Economics, Michigan State University.

Little, I. M. D., Mazumdar, D. and Page, J. (1987). *Small Manufacturing Enterprises in Developing Countries: A Comparative Study of India and other Countries.* New York: Oxford University Press.

Malaysia, (2005). Second Industrial Master Plan (IMP2), 1996-2005.

Moha, A. (1999). *Small and Medium Enterprises in Malaysia: Policy Issues and Challenges*. Vermont, Ashgate.

Meeusen. W. and J. van den Broeck. (1977). *Efficiency Estimation from Cobb-Douglas Production Functions with Composed Error. International Economic Review,* **18,** 435-444.

Ndubisi, N. O. (2003). *Service quality: Understanding customer perception and reaction, and its impact on business. International Journal of Business*, **5 (2)**, 207–219.

Saleh, A. S. and Ndubisi, N. O. (2006). *An Evaluation of SME Development in Malaysia", International Review of Business Research Papers.* **2 (1)**, 1-14.

Sazali A. M., Alias R. and Rossazana A. R. (2004). *Technical Efficiency on Furniture Industry in Malaysia.* The Asian Economic Review, Journal of the Indian Institute of Economics, **46 (2)**, 377-384.

SMIDEC (2002). *SMI Development Plan (2001–2005).* Percetakan Nasional Malaysia Berhad, Kuala Lumpur SMIDEC 2004. "SME Performance 2003", Report, Kula Lumpur, Malaysia.

Stuti, K. IAS. (2005). *Overcoming Barriers to Innovation for Indian SMEs.* Ministry Small Scale Industries, New Delhi, India.

Tan, Hong and Geeta Batra (1995). *Enterprise Training in Developing Countries: Incidence, Productivity Effects, and Policy Implications*. Private Sector Development Department, The World Bank, Washington, D.C.

Tan, Hong (2003), *Impact Evaluation of Mexico's SME Training Program.* Working Paper, World Bank Institute.

Ting, O. K. (2004). *SMEs in Malaysia: Pivot points for Change*. Online available at http://www.mca.org.my.

Wan, S. D. (2003). *The Implications of E-Financing: Implications for SMEs.* Bulletin on Asia-Pacific Perspective 2003–2004, United Nations.